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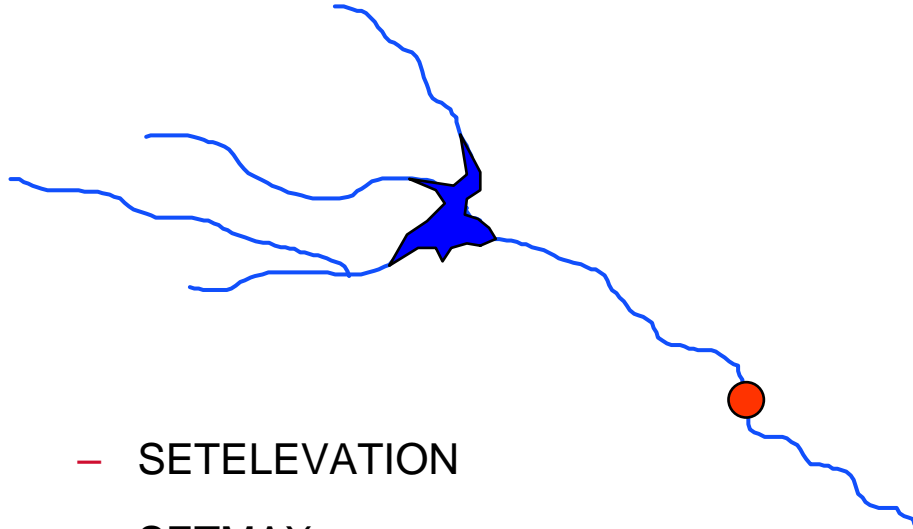
# ***RES-J***

## Methods

# RES-J Methods

## Methods

- ADJUST
- BALANCE
- LAGK
- MAXDECREASE
- MAXINCREASE
- MAXSTAGE
- RAINEVAP
- SETELEVATION
- SETMAX
- SETMIN
- SETRELEASE
- SETSUM
- SETWITHDRAW
- SPILLWAY



# ***RES-J Adjust Method Parameters***

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The ADJUST method uses observed instantaneous discharges, mean discharges, and pool elevation values to adjust the simulated values to be consistent with the observations.

- 🔥 Input time series
- 🔥 Number of time steps for blending from an observed value
- 🔥 Simulated pool is adjusted at each time step
- 🔥 Consider a feature to adjust only the carryover values

# ***Adjust Method Example***

---

```
ADJUST      WINSTON      WINSTON_ADJUST
            OBSERVEDPOOL WIN_OBS_POOL
            BLENDTS      5
ENDADJUST
```

# ***Balance Method Parameters***

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The BALANCE method computes reservoir releases by balancing the available storage among multiple reservoirs.

- 💧 Option to balance by volume or percent of flood storage
- 💧 Minimum and maximum pool elevations for each reservoir
- 💧 Minimum release for each reservoir

# Balance Method Example

---

```
BALANCE          Madden          Mad_Gat_Bal
  VOLUME
  RESERVOIR      Gatun
    VALUES      LOWER POOL      135
                  UPPER POOL      140
                  MINRELEASE      12.4
      ENDVALUES
  ENDRESERVOIR
  RESERVOIR      Madden
    VALUES      LOWER STORAGE    1200000
                  UPPER STORAGE    1900000
                  MINRELEASE      11.8
      ENDVALUES
  ENDRESERVOIR
ENDBALANCE
```

# ***RES-J LAGK Method Parameters***

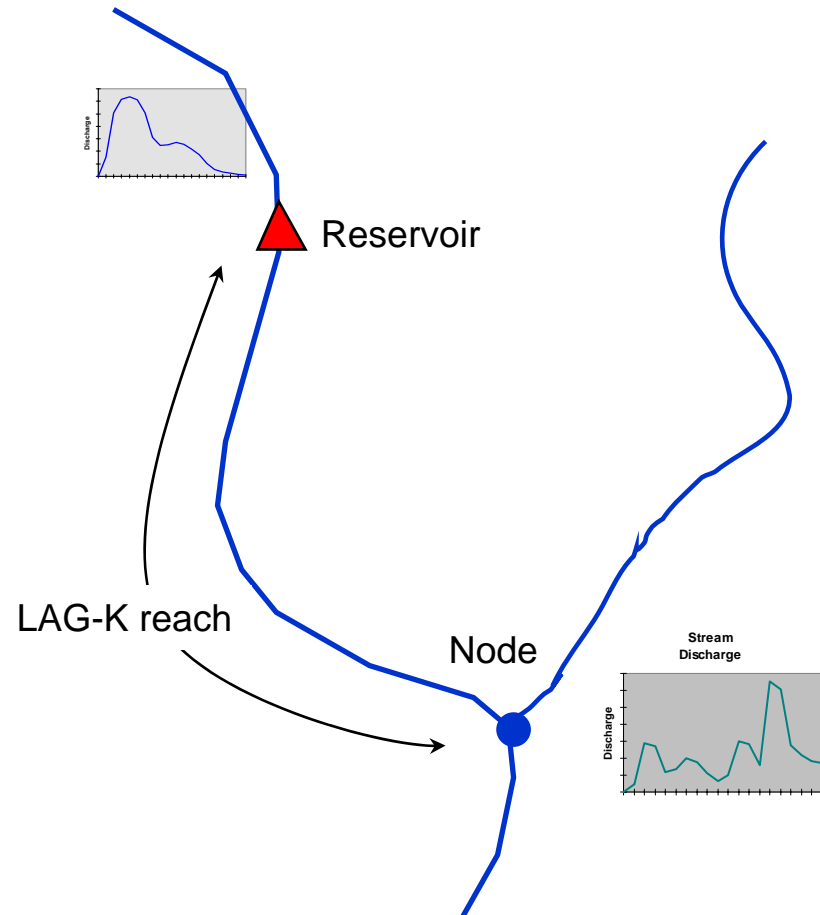
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The LAGK method performs reach routing using the Lag and K routing procedure.

- 🔴 Lag time in hours
- 🔴 K coefficient (constant or a table of outflow versus K)
- 🔴 Inflow carryover information
- 🔴 LAG-K is applicable only to reach components
- 🔴 useful for constructing valid networks; permitting operations based on downstream outcomes.

# LAGK Method Example

```
LAGK    WINSTON    ST_MDKR2
LAG 12
K       7
COINFLOW
VALUES
    1000
    1000
    1000
    1000
ENDVALUES
ENDCOINFLOW
ENDLAGK
```





# ***MAXDECREASE/MAXINCREASE Method Parameters***

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- 💧 The MAXDECREASE / MAXINCREASE method limits the maximum decrease / increase in reservoir release from one time-step to the next
- 💧 MAXDECREASE - Maximum allowable decrease in flow (per time step)
- 💧 MAXINCREASE - Maximum allowable increase in flow (per time step)

# ***MAXDECREASE/MAXINCREASE Method Example***

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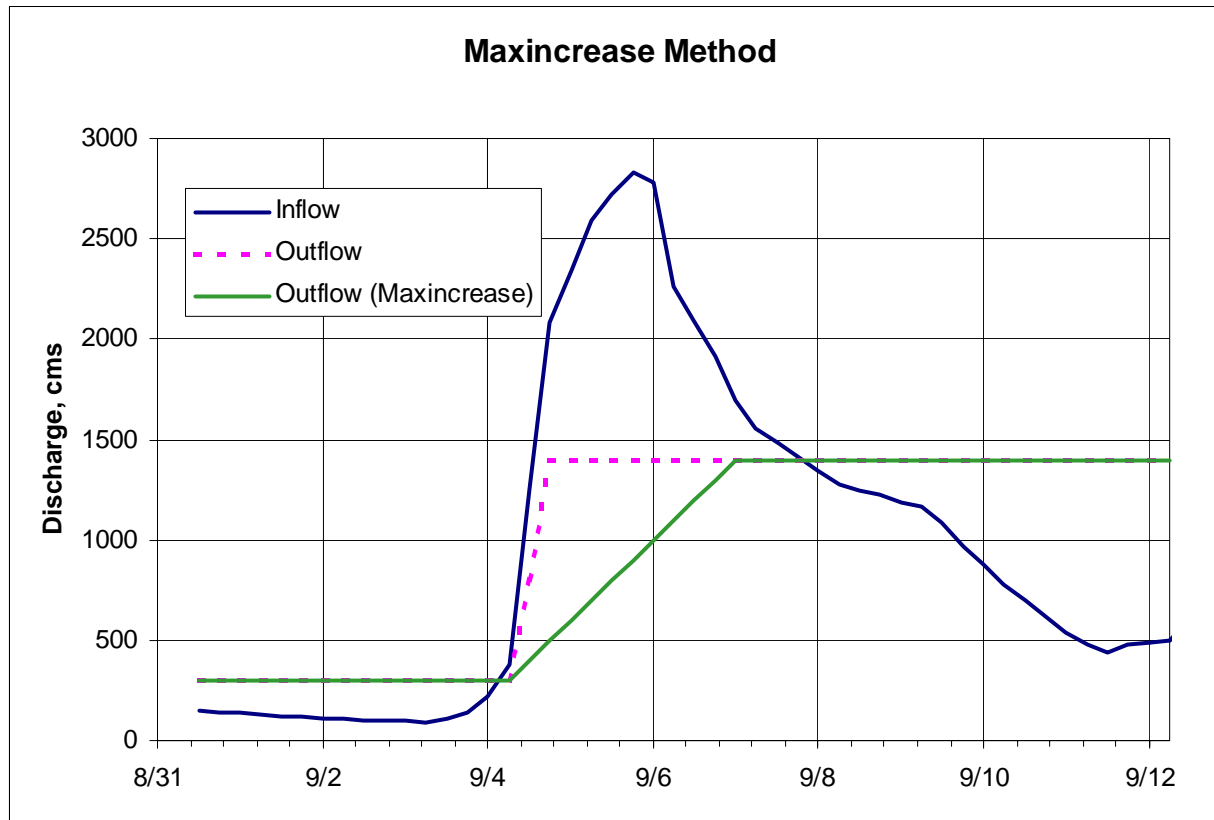
```
MAXDECREASE  WESTOVER WEST_DECR  
  DECREASE    400.  
ENDMAXDECREASE
```

```
MAXINCREASE  WESTOVER WEST_INC  
  INCREASE    100.  
ENDMAXINCREASE
```

RULES

```
.  
.   
.   
[WESTOVER.POOL < 1241.7]  
  :: MAXINCREASE WEST_INC  
.   
. 
```

# Maxincrease Method Example



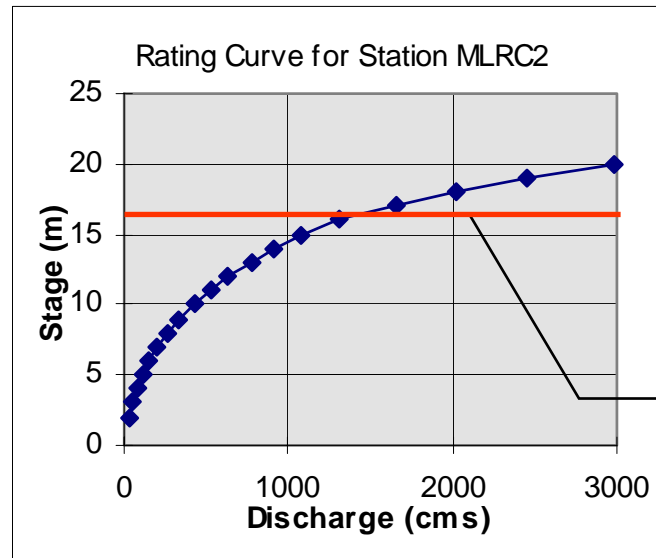
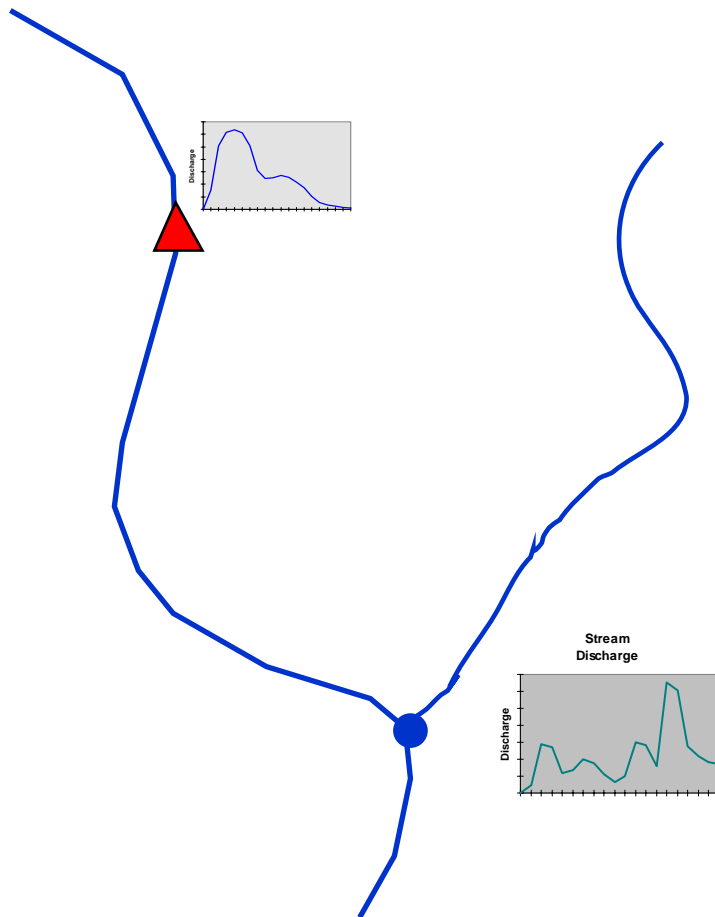
# ***MAXSTAGE Method Parameters***

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The MAXSTAGE method computes a restricted reservoir release to control the stage at a downstream control point

- 💧 Table of rating curve values
- 💧 Maximum allowable stage at the downstream control point
- 💧 Minimum allowable reservoir release
- 💧 Convergence criterion
- 💧 Downstream node identifier
- 💧 Maximum number of iterations for solving

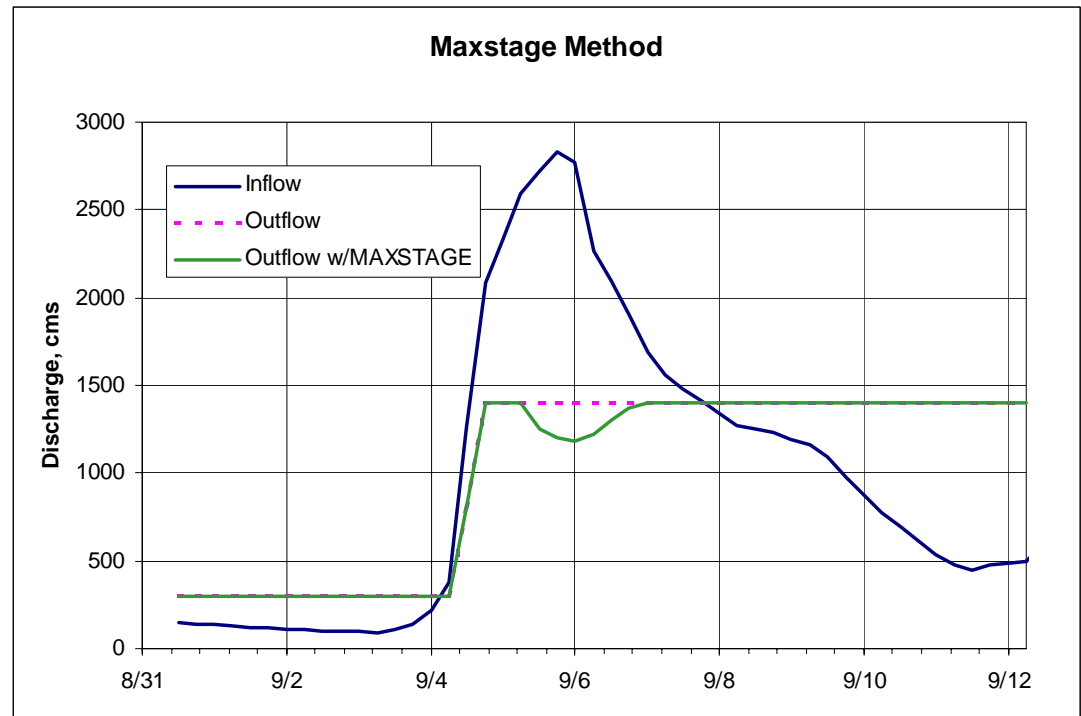
# MAXSTAGE Method Example



Critical  
stage at  
MLRC2

# MAXSTAGE Method Example

```
MAXSTAGE  WINSTON  ST_MLRC2
TABLE      MLRC2_RATING
  1      50
  5     200
 10     450
 15    1100
 20    3000
ENDTABLE
MAXIMUMSTAGE 16.1
MINRELEASE    250
DSCONTROL MLRC2_GAGE
MAXITERATIONS      15
ENDMAXSTAGE
```



# ***RAINEVAP Method Parameters***

---

The RAINEVAP method computes the change in reservoir storage resulting from rain and evaporation occurring over the lake surface.

- 💧 Time series identifier for observed evaporation and observed rainfall
- 💧 Table of average evaporation values by date
- 💧 Optional diurnal distribution of daily evaporation
- 💧 Loss is computed based on reservoir surface area at beginning of time-step

# RAINEVAP Method Example

RAINEVAP WINSTON WN\_RAINEV

PRECIP

TSINPUT ObservedPrecip WIN\_MAP

ENDPRECIP

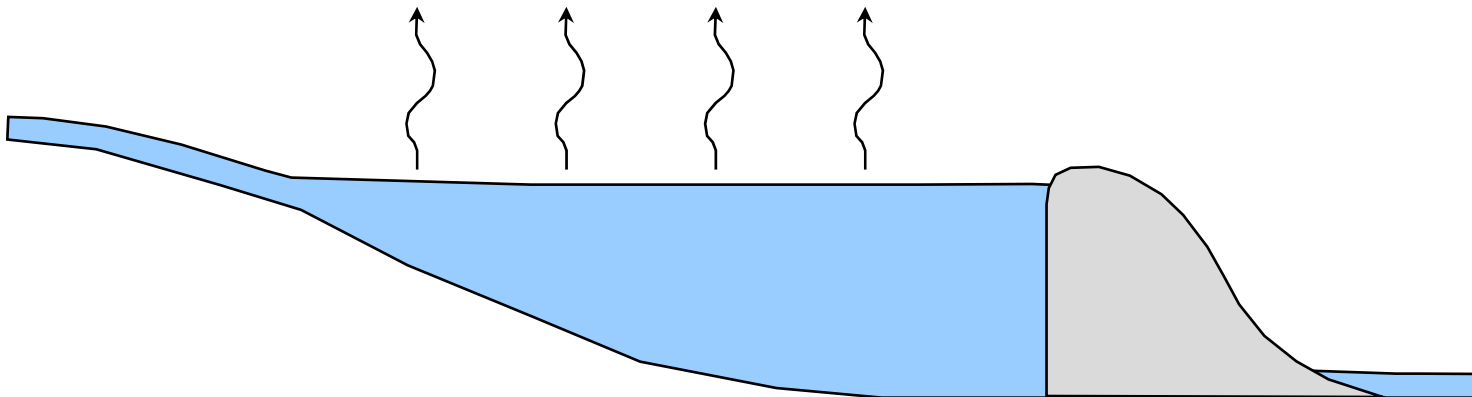
EVAP

VALUES	01/01	0.13				
	04/01	0.20				
	07/01	0.25	0.3	0.3	0.25	0.15
	10/01	0.18				

ENDVALUES

ENDEVAP

ENDRAINEVAP





# ***SETELEVATION Method Parameters***

---

The SETELEVATION method computes a reservoir release in order to achieve a prescribed reservoir pool elevation. The elevation can be specified in a table as a function of date or can be given as a time series.

- ◆ Observed pool elevation time series
- ◆ Reservoir rule curve information in date/elevation pairs
- ◆ Period for blending between rule curve values and time series values
- ◆ Period for blending between rule curve dates
- ◆ Interpolation option
- ◆ (interpolation and date blending are mutually exclusive)

# ***SETELEVATION Method Example***

---

```
SETELEVATION WINSTON WIN.FLOOD
      TSINPUT  OBSERVEDPOOL  WIN_POOL
VALUES
      01/01    205.0
      04/01    208.0
      07/01    210.0
      10/01    215.0
ENDVALUES
BLENDTBL                      30
BLENDTS                        8
ENDSETELEVATION
```

# ***SETMAX / SETMIN Method Parameters***

---

The SETMAX / SETMIN methods selects the maximum / minimum release (or withdrawal) from a list of previously computed methods.

- Other method identifiers from which to compute maximum / minimum output variable

# ***SETMAX / SETMIN Method Example***

---

```
SETMIN WINSTON                               WIN_MIN
      SETRELEASE WINSTON                     WIN.FLOOD
      SETELEVATION WINSTON                   WIN_RULE
      MAXSTAGE WINSTON                      ST_MLRC2
ENDSETMIN
```

```
SETMAX WINSTON                               WIN_MAX
      SETRELEASE WINSTON                     WIN_SPILL
      SETMIN WINSTON                        WIN_MIN
ENDSETMAX
```

# ***SETRELEASE Method Parameters***

---

The SETRELEASE method computes reservoir release based on a table that specifies release as a function of date and pool elevation, or as a prescribed release entered as a time series.

- Observed release time series
- Table of elevation/release values by date
- Period for blending between table values and time series values
- Period for blending between elevation/release table dates
- Interpolation between elevations and/or dates

# SETRELEASE Method Example

---

SETRELEASE	Madden	Power_Rel		MAD_OBS_POWER	
TSINPUT	Observed_Rel				
VALUES					
ELEV 215	220	230	240	250	ENDELEV
01/01 300	300	350	400	500	
04/01 310	310	375	450	550	
07/01 350	400	450	500	750	
10/01 310	310	375	450	550	
ENDVALUES					
BLENDTBL	0				
BLENDTS	0				
NORMAL					
ENDSETRELEASE					

# ***SETSUM Method Parameters***

---

The SETSUM method computes reservoir release (or withdrawal) as the sum of previously computed reservoir release (or withdrawal) methods.

- 💧 Method identifiers from which to compute sum of output variables
- 💧 Valid methods are:
  - SETMAX
  - SETMIN
  - SETRELEASE
  - SETWITHDRAW

# ***SETSUM Method Example***

---

```
SETSUM Madden Power&Spills
      SETRELEASE      Madden Power
      SETRELEASE      Madden Spill
ENDSETSUM
```



# ***SETWITHDRAW Method Parameters***

---

The SETWITHDRAW method computes reservoir withdrawal based on a table that specifies withdrawal as a function of date and pool elevations, or as a prescribed withdrawal entered as a time series.

- 💧 Observed withdrawal time series
- 💧 Table of elevation/withdrawal values by date
- 💧 Period for blending between elevation/withdrawal table dates
- 💧 Period for blending between elevation/withdrawal table values and time series values

# ***SETWITHDRAW Method Example***

---

```
SETWITHDRAW  Madden      Muni
              TSINPUT      Observed_Muni Mad_Muni
              VALUES
                  ELEV      80.0      ENDELEV
                  01/01      125
                  04/01      130
                  07/01      120
                  10/01      310
              ENDVALUES
              BLEND  0
              BLENDTS      0
              NORMAL
ENDSETWITHDRAW
```

# ***SPILLWAY Method Parameters***

---

The SPILLWAY method computes reservoir discharge as a function of reservoir elevation when the elevation exceeds the reservoir spillway crest.

- 💧 Table of elevation verses spill
- 💧 One elevation spill pair per line
- 💧 Specify the number of integer value intervals the simulation time step should be sub-divided into to enable pseudo-implicit solution of water balance equation.

# ***SPILLWAY Method Example***

---

SPILLWAY LOYALHANNA TEST

TABLE ELEV\_SPILL

915.9 0.0

916.0 15.0

922.0 725.0

924.0 775.0

925.0 850.0

926.0 935.0

928.0 1110.0

.

.

.

985.0 108000.

ENDTABLE

INTERVALS 12

INITIALSPILL 0

ENDSPILLWAY